IDENTITY OF NARROW-LEAVED *CHRYSOTHAMNUS VISCIDIFLORUS* (ASTERACEAE)[1]

Loran C. Anderson[2]

Abstract.— Two groups of glabrous, narrow-leaved *Chrysothamnus viscidiflorus* (Asteraceae) are perceived, and appropriate taxonomic combinations are made, i.e., *C. v.* ssp. *viscidiflorus* var. *stenophyllus* and *C. v.* ssp. *axillaris*. The two are fairly distinct geographically, and they can be separated by floral morphology. A key to all species of section *Chrysothamnus* (to which *C. viscidiflorus* belongs) is given.

Classification of intraspecific variants of *Chrysothamnus viscidiflorus* has been problematic, in part, because floral features seemingly lacked sufficient distinctions. Hence, vegetative aspects such as stature, vesture, and leaf dimensions have been used. Experimental studies (Anderson 1964) have demonstrated that in many instances plant height, leaf twisting, and leaf width are expressions of differing edaphic conditions, droughtiness, or other environmental parameters and thereby complicate taxonomic resolution.

Study of interpopulational variation and the distribution of the narrow-leaved, yellow rabbitbrush (*C. viscidiflorus* ssp. *stenophyllus*) reveals that there are two different taxa represented. One is found sporadically through the northern latitudes of the western United States and into southern California (open circles in Fig. 1). The other taxon (stars, Fig. 1) is found further south and is more generally distributed, i.e., has a more pronounced "range integrity." In south-central Nevada, Beatley (1976) reports it is the common *Chrysothamnus* of basin floors and foothills, especially in volcanic areas and on disturbed sites, usually below 5500 ft. Examination of populations at possible type locality sites (type specimens labeled either West Humboldt Mountains or Huntington Valley) for ssp. *stenophyllus* shows that the narrow-leaved plants represent extremes of the broader-leaved ssp. *viscidiflorus*.

I have concluded from field observations, garden culture, and herbarium studies that the northern elements, which include the type collection of *C. v.* ssp. *stenophyllus*, are actually environmentally induced variants of ssp. *viscidiflorus*. Although quadrinomials are cumbersome, the following nomenclatural combination more appropriately identifies the relationship of these plants:

Chrysothamnus viscidiflorus (Hook.) Nutt. ssp. _viscidiflorus_ var. _stenophyllus_ (Gray) L. C. Anderson, comb. nov.

Basionym: *Bigelovia douglasii* Gray var. *stenophylla* Gray. Proc. Am. Acad. Sci. 8:646, 1873. W. Humboldt Mtns, Nevada, *Watson 566* (GH, holotype; NY, US, isotypes).

Synonymy: *Chrysothamnus pumilus* Nutt. var. *varus* A. Nels. Bot. Gaz. 28: 375, 1899. Centennial Valley, Wyoming, *Nelson 1847* (RM, holotype; GH, NY, isotypes).

The southern elements that had previously been referred to ssp. *stenophyllus* warrant subspecific recognition. Their narrow-leaved characteristic is independent of environmental conditions. These plants are diploids; broad-leaved forms of ssp. *viscidiflorus* that grow in the same region are tetraploids or hexaploids (Anderson, 1966, 1971). The only available name for these narrow-leaved plants is *C. axillaris*. In 1964, I noted that *C. axillaris* was not specifically distinct from *C. viscidiflorus*, and the name was synonomized under ssp. *stenophyllus*. Munz (1968), in re-

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[2]Department of Biological Science, Florida State University, Tallahassee, Florida 32306.

ferring to my studies, stated I had made *C. axillaris* a subspecies of *C. viscidiflorus*. The statement was inaccurate at that time—but prophetic. The combination is now made:

***Chrysothamnus viscidiflorus* (Hook.) Nutt. ssp. *axillaris* (Keck) L. C. Anderson, comb. & stat. nov.**

Basionym: *Chrysothamnus axillaris* Keck. Aliso 4:103, 1958. Deep Springs Valley, California, *Ferris 6924* (NY, holotype; DS, LL, POM, isotypes).

Keck (1958), in describing *C. axillaris*, related it to *C. albidus* and more distantly to *C. greenei*. Actually, ssp. *axillaris* is not close to *C. albidus* in relationship, but it is to *C. greenei*. In fact, the type collection of ssp. *axillaris* with very acute phyllaries suggests some intergradation with *C. greenei*. Keck stated that the latter was known only from eastern Nevada and eastward, but it does extend through southern Nevada into Inyo County, California. At its western limit in California and also in northeastern Arizona, *C. greenei* intergrades somewhat with *C. viscidiflorus*. The feature of vertically aligned phyllaries noted by Keck (1958) is not consistent for ssp. *axillaris* (Anderson 1964).

Although ssp. *axillaris* and var. *stenophyllus* are fairly distinctive habitally, they could not be "keyed out" easily unless reference was made to geographic distribution (Fig. 1). Floral morphology was studied in search of additional distinguishing features. Methods are those used earlier (Anderson 1964). Detailed floral data and a list of specimens examined are on file at FSU. Significant comparisons are graphically illustrated in Figure 2.

Involucral width in *Chrysothamnus* is generally strongly correlated with flower number because more flowers per head require a broader receptacle. The pattern is evident in

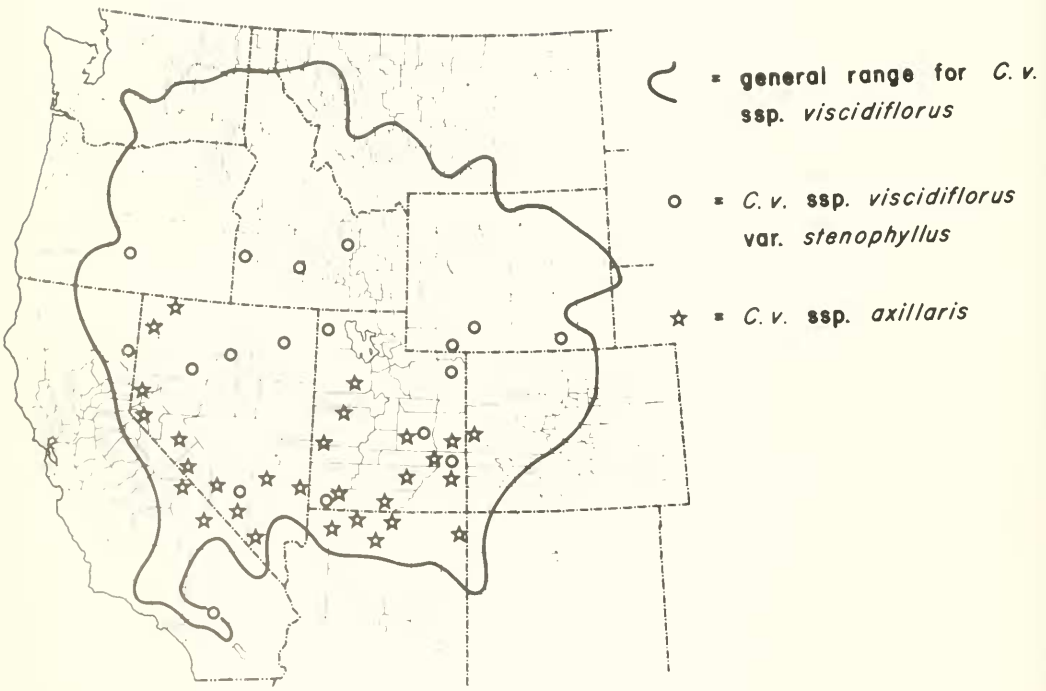

Fig. 1. Range of *Chrysothamnus viscidiflorus* ssp. *viscidiflorus* and ssp. *axillaris*. Range for ssp. *viscidiflorus* nearly equals that of the species; ssp. *lanceolatus* extends into southern British Columbia and north-central New Mexico. Distribution of ssp. *axillaris* (stars) is fairly general through southern parts of Utah and Nevada and adjacent regions, whereas that of ssp. *viscidiflorus* var. *stenophyllus* (open circles) is sporadic, but mostly north of ssp. *axillaris*.

C. viscidiflorus ssp. *viscidiflorus*, wherein plants averaging 10.8 (with up to 12) flowers per head have involucral widths over 50 percent of involucral length (Fig. 2); these plants represent an altitudinal record for the genus of 12,800 ft in the White Mountains of California. Previous descriptions of *C. viscidiflorus* listed flower number as about 5 (Hall and Clements 1923). Nearly all plants of ssp. *viscidiflorus* with high flower number come from altitudes over 10,000 ft. Most populations of the subspecies, including var. *stenophyllus*, have 4–6(7) flowers per head with proportionately narrower involucres.

Heads of ssp. *axillaris* depart from the basic correlation of flower number—involucral width/length ratio. Although they average fewer than 5 flowers per head, the width/length ratio for the involucre is high (Fig. 2). Thus, ssp. *axillaris* and var. *stenophyllus* can be distinguished by floral features as well as geographically.

Taxonomic interpretation of *Chrysothamnus* section *Chrysothamnus* (to which *C. viscidiflorus* belongs) has been altered considerably since Hall's monograph (Hall and Clements 1923). *Chrysothamnus vaseyi* and *C. molestus* (*C. viscidiflorus* var. *molestus*) have been transferred to section *Pulchelli* (Anderson 1970) and *C. gramineus* to *Petradoria* (Anderson 1963). Additional species have been recognized in the section. A key to section *Chrysothamnus* as currently understood is presented here.

Fig. 2. Correlation of involucral shape and flower number in heads of *Chrysothamnus viscidiflorus* ssp. *viscidiflorus* (closed circles, var. *viscidiflorus*; open circles, var. *stenophyllus*) and ssp. *axillaris* (stars). Vertical axis represents the involucral width/length relationship expressed as percent; the horizontal axis is average flower number per head. Note that ssp. *axillaris* departs from the general correlation in ssp. *viscidiflorus* and other members of the genus.

1. Flowers white; leaves terete, strongly punctate ..... *C. albidus* (Jones) Greene
— Flowers yellow; leaves planate or involute, not punctate 2

2(1). Flowers 2–3(4); style branches included in erect corolla lobes; plants mostly less than 1.5 dm tall ..... *C. humilis* Greene
— Flowers (3)4–6; styles exerted beyond spreading corolla lobes; plants often over 2 dm tall 3

3(2). Style appendages long (40–70 percent of style branch); leaves never twisted or involute; tall shrubs 4
— Style appendages short (30–45 percent of style branch); leaves frequently twisted or involute 5

4(3). Leaves lanceolate; achenes densely pubescent ..... *C. linifolius* Greene
— Leaves spatulate to oblanceolate; achenes sparsely pubescent ..... *C. spathulatus* L.C.Anders.

5(3). Phyllaries acuminate-cuspidate; leaves 1–2 mm wide ..... *C. greenei* (Gray) Greene
— Phyllaries obtuse to acute; leaves 1–10 mm wide (*C. viscidiflorus*) 6

6(5). Leaves planate, glabrous; flowers 3.5–4(4.5) mm long ..... *C. v.* ssp. *planifolius* L.C.Anders.

— Leaves twisted or pubescent or flowers longer 7

7(6). Upper stems, frequently leaves, hairy 8

— Stems glabrous; leaves only ciliate 9

8(7). Stems and leaves puberulent; leaves 1–2(4) mm wide ..... *C. v.* ssp. *puberulus* (D.C.Eat.) H.&C.

— Stems hispid near inflorescence; leaves over 2 mm wide, hirsute or glabrous ..... *C. v.* ssp. *lanceolatus* (Nutt.) H.&C.

9(7). Leaves ± 1 mm wide; flowers 3–4(5); involucres somewhat turbinate ..... *C. v.* ssp. *axillaris* (Keck) L.C.Anders.

— Leaves 1–10 mm wide; if 1 mm, flowers 4 or more and involucres narrowly cylindric 10

10(9). Leaves more than 1.5 mm wide; plants up to 1 m tall. ..... *C. v.* ssp. *viscidiflorus* var. *viscidiflorus*

— Leaves 1–1.5 mm wide; plants mostly less than 3 dm tall ..... *C. v.* ssp. *viscidiflorus* var. *stenophyllus* (Gray) L.C.Anders.

Names often applied in *C. viscidiflorus*, but not representative as distinct subspecies, include: (1) *elegans*, usually misapplied to certain forms of ssp. *puberulus* with bracts with enlarged green tips, but the type specimen does not have such bracts and is clearly part of ssp. *lanceolatus*; (2) *pumilus*, low form that is part of ssp. *viscidiflorus*; (3) *tortifolius*, environmental variant with strongly twisted leaves, part of ssp. *viscidiflorus*; and (4) *latifolius*, wide-leaved plants from northern Nevada that could be considered a variety of ssp. *viscidiflorus*; however, not all wide-leaved plants of the subspecies would belong to that variety.

A conceptual distinction between subspecies and variety exists in *Chrysothamnus* for me. Subspecies is applied to groups of populations with pronounced geographical and fairly distinct morphological limits. The variety can be applied in two ways. It may represent a sporadic but rather distinctive morphotype within a given subspecies, such as ssp. *viscidiflorus* var. *stenophyllus*, and it could possibly be applied to such variation in species where subspecies are not recognized, such as *C. greenei* var. *filifolius* for the narrow-leaved variant. The second application (my preferred usage) of variety would be for elements of a subspecies that have some fairly consistent morphological distinction and also have relatively sharp geographic limits, but are clearly subordinate to the subspecies. An example would be ssp. *viscidiflorus* var. *latifolius*—if the combination were made. Publication of additional quadrinomials as needed to clarify relationships in the genus will be part of my upcoming monograph.

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